Abstract Submission for the 11th INTERNATIONAL MEETING on STATISTICAL CLIMATOLOGY

Suggested session: “Predictions of climate change relevant for impacts” (Xuebin Zhang, Bruce Hewitson). The topic is also relevant to “Evaluation and uncertainty estimation from multimodel and perturbed physics ensembles” (Reto Knutti, ETHZ)

Understanding the Relevance of Climate Model Simulations to Informing Policy: an example of the application of MAGICC to greenhouse gas mitigation policy

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A central debate in international climate change policy over the last decade has been around the question of: how rapidly must global greenhouse emissions be reduced to avoid “dangerous anthropogenic interference” (DAI) with the Earth’s systems. Over the past few years, consensus has begun to form around the goal to limit global warming to two degrees above pre-industrial levels. This was reflected in the ‘Copenhagen Accord’, which was noted by parties to the United Nations Framework Convention on Climate Change (UNFCCC) in December 2009. Partly in response to this increased recognition, a growing number of studies have explored what global emissions reductions would be required to meet such a goal with a defined probability of success. Here, we explore to what extent current climate models are adequate to provide such information and how climate model output might be robustly used in decision-making.

We take the example of Bowen and Ranger (2009). Bowen and Ranger evaluated a ‘plausible envelope’ of global emissions paths that would secure at least a 50 per cent chance of limiting global warming to two degrees above pre-industrial levels. Probabilistic climate projections for twenty paths were evaluated using a version of “MAGICC”, a simple climate model. The resultant temperature distributions aimed to represent parameter uncertainty in the model. The study concluded that, under a low aerosol scenario, global emissions would need to peak in the next five to ten years and then be reduced to less than 48 $GtCO_2e$ in 2020 to give at least a 50 per cent chance of limiting warming to two degrees. Under a high aerosol scenario, the upper limit was 54 $GtCO_2e$ in 2020. We explore the extent to which such information can be considered informative to policy, given the uncertainties inherent in the approach; an evaluation framework based on ‘necessary, not sufficient’ tests of model adequacy is presented for discussion.

An important aspect of Bowen and Ranger (2009), and its partner Stern (2009), was the use of economics to facilitate decision-making under uncertainty. It together considered the uncertainties in the level of DAI, the science of a global emissions target and the economics of mitigation and from this presented a number of options and recommendations. The conclusions centred on the need to maintain future flexibility. We discuss the relationship between the economics and science in this example and how the lessons learnt translate to the interpretation of climate model information for adaptation and the design of model experiments to better inform decision-making.

Bowen, A. and N. Ranger (2009) "Mitigating climate change through reductions in greenhouse gas emissions: the science and economics of future paths for global annual emissions" Grantham/CCCEP Policy Brief No. 2, http://www2.lse.ac.uk/GranthamInstitute/publications/PolicyBriefsandPapers/PBMitigatingBowenRangerDec09.pdf

Stern, N. (2009) “Deciding our future in Copenhagen: will the world rise to the challenge of climate change?”, http://www2.lse.ac.uk/GranthamInstitute/publications/PolicyBriefsandPapers/PBActionSternDec09.pdf